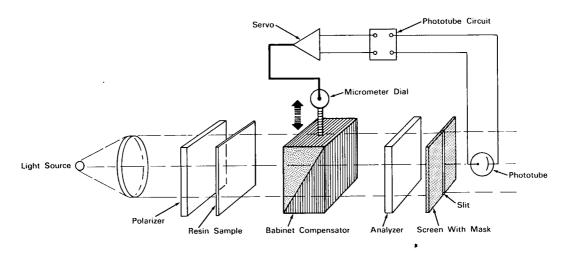
## NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the space program.



## Servo System Facilitates Photoelastic Strain Measurements on Resins



The problem: To facilitate photoelastic measurements (the analysis of changes produced in a polarized light beam passing through a stressed specimen) of the strains developed by stresses applied to samples of birefringent resins.

**The solution:** A servo system used in conjunction with apparatus operating on the principle of photoelasticity.

How it's done: A beam of white light on passing through the optical system consisting of a polarizer, a Babinet compensator, and an analyzer (a polarizer with its plane of polarization at right angles to that of the first polarizer), appears on a screen placed behind the analyzer as a parallel series of spectral color fringes separated by parallel dark lines. When a sample of the resins is positioned between the polarizer and the Babinet compensator and subjected to stress (tensile or compressive), a phase difference will

be introduced which will cause a shift in the central dark line on the screen. The amount of shift corresponding to the applied stresses furnishes an index to the stress-strain characteristics of the resin.

In making a measurement, a movable mask with a central slit is placed over the screen, and the mask is positioned so that the slit is centered over the central dark line of the fringes. The light passing through the slit is intercepted by the phototube which provides an output to a servo. The servo rebalances the Babinet compensator to restore the dark line to its original (null) position in the slit, and the amount of shift of the line is indicated on a micrometer dial or recorder. To obtain accurate readings, the system is biased to null on the outer edge of the central dark line. The response time of the servo should not be exceeded in applying stresses to the resin sample in order to prevent the system from locking on one of the adjacent fringes.

(continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government, nor NASA, nor any person acting on behalf of NASA: A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in

this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe privately-owned rights; or B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this document.

## Notes:

- 1. This apparatus should be useful in production control and development testing of transparent birefringent films of various compositions.
- 2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, California, 91103 Reference: B64-10280 Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: J. W. Otts (JPL-504)